

### III. REMARKS/ARGUMENTS

#### 1. Amendment to the specification

The specification was amended to correct a typographical error by replacing "1-hexane" with --1-hexene--. One of skill in the art would recognize that 1-hexene was intended. This amendment does not add new matter.

#### 2. Status of the Claims

Claims 19 and 20 are cancelled by the present amendment without prejudice. Claims 1-18 are pending in the application. Claims 2, 3, 5-6, and 8-18 have been amended by changing the first word of the claim from "A" to --The--. Claim 1 has been amended by changing "is" in line 5 to --being-- and by inserting --being-- after the word "compound" in line 7. These amendments clarify the claims and overcome the Examiner's objections. These are not narrowing amendments and do not affect the scope of the claims in any way.

#### 3. Claim Rejections under 35 U.S.C. § 102

##### a) The Kaus Reference

The Examiner rejected claims 1-10 and 13-18 under 35 U.S.C. § 102 as allegedly being anticipated by U.S. Patent No. 4,347,158, by Kaus et al. Specifically, the Examiner alleged that Kaus teaches a catalyst comprising (A) a catalyst component and (B) triethyl aluminum. The catalyst component of Kause is prepared by (a) co-comminuting a magnesium chloride support base and aluminum trichloride, (b) co-comminuting anisole with the resulting product from (a), (c) co-comminuting the resulting product with ethyl benzoate, and (d) co-comminuting the resulting product of (c) with titanium tetrachloride. Applicants respectfully traverse.

The Kaus reference does not anticipate the instant claims because Kaus does not teach every element of the claims. Specifically, Kaus does not teach or disclose a catalyst component

that includes an aluminum compound represented by the general formula  $\text{Al}(\text{OR}')_3$ , where  $\text{R}'$  is an alkyl radical. Instead, the catalyst component of Kaus uses an inorganic Lewis acid selected from the group consisting Group IIIA halides, phosphorous trichloride and phosphorous oxytrichloride..  $\text{AlCl}_3$ , which is an inorganic salt, is preferred. Nowhere in the Kaus reference is a compound represented by the general formula  $\text{Al}(\text{OR}')_3$  taught or suggested. It would be very obvious to one of skill in the art that the aluminum compound represented in the general formula  $\text{Al}(\text{OR}')_3$ , which is an element of the instant claims, does not belong to the group of inorganic Lewis acids taught by Kaus.

Applicants note that Kaus uses an organoaluminum (trialkyl aluminum) compound as a co-catalyst for olefin polymerization. *See, e.g.*, col. 4, ll. 59-65. However, Applicants stress that this is not the same as using a compound represented by the general formula  $\text{Al}(\text{OR}')_3$  as an ingredient in a **catalyst component** that is in turn used in combination with an alkyl aluminum co-catalyst. The catalyst component and the alkyl aluminum co-catalyst should not be confused with each other. One of skill in the art will appreciate, as explained in the introduction of the Kaus reference, that alkyl aluminum compounds have long been used with titanium compounds as a catalyst system for olefin polymerization. *See*, col. 1, ll. 15-21. All Ziegler-Natta catalysts require a co-catalyst and alkyl aluminum is the commonly preferred co-catalyst. As pointed out in Kaus, cols. 1 and 2, deficiencies in the Ziegler-Natta catalyst system have lead to many attempts to derive catalyst components to use in conjunction with the alkyl aluminum co-catalyst and thereby improve polymerization performance. The fact that trialkyl aluminum is used as a co-catalyst would not motivate one of skill in the art to utilize an organoaluminum compound as an ingredient in a catalyst component, which is to be used in combination with a trialkyl

aluminum co-catalyst. The Kaus reference does not teach one of skill in the art to utilize an organo-aluminum compound as an ingredient in a catalyst component, which is used in combination with a trialkyl aluminum co-catalyst. Kaus specifically does not teach using a compound represented by the general formula  $\text{Al}(\text{OR}')_3$ , which is an element of the instant claims.

Furthermore, the instant claims require that the compound represented by the general formula  $\text{Al}(\text{OR}')_3$  be pulverized with the other catalyst component ingredients. See instant claim 1 (A). The alkyl aluminum co-catalyst (B) is not required to be pulverized with the other catalyst components and in practice is typically charged into the polymerization reactor along with the catalyst component (A). Likewise, the Kaus catalyst component is prepared by milling aluminum trichloride with the other ingredients of the catalyst component. See Kaus, Example 1. The trialkyl aluminum is then charged to the polymerization reactor along with the catalyst component. *Id.* This further demonstrates that the trialkyl aluminum is a co-catalyst and not an ingredient of the Kaus catalyst component. Nowhere does Kaus teach or suggest preparing a catalyst component by co-pulverizing a magnesium compound, a compound represented by the general formula  $\text{Al}(\text{OR}')_3$ , an electron donor, and a titanium compound.

The catalysts of the present claims provide significantly and unexpectedly better olefin polymerization results than the Kaus catalyst, as measured by every major property in the embodied examples and comparative examples. Instant Example 1 (pp. 26-28) and Example 2 (pp. 31-32) describe the preparation of a catalyst according to the instant claims and the use of said catalyst for the homopolymerization of ethylene and for the copolymerization of ethylene and 1-hexene. Comparative Example 5 (p.31) describes the preparation a catalyst using  $\text{AlCl}_3$  to

replace  $\text{Al(OR')}_3$  in Example 1. This catalyst was used for homopolymerization of ethylene and for the copolymerization of ethylene and 1-hexene under the same condition as in the Example 1 & 2. The results obtained for comparative Example 5 shows that  $\text{AlCl}_3$  and  $\text{Al(OR')}_3$  are not interchangeable and do not behave similarly when used in a catalyst component. Comparative Example 6 (pp. 32-33) describes polymerization and copolymerization using the Kaus catalyst under the same conditions as described in Examples 1 & 2. Comparative Example 7 (pp. 33-34) describes a catalyst according to Kaus, but using the same amount of titanium as used in Examples 1 and 2. Example 7 demonstrates that the instantly claimed catalyst component performs better than the Kaus catalyst even if the titanium content is the same. The table below summarizes the results.

Example	Cat. Activity (gPE/g.Cat.bar.hr)	Bulk Density (g/cm <sup>3</sup> )	Melt index (g/10 min. @ 2.16Kg)	Hexane extractable (wt %)	Density (g/cm <sup>3</sup> )
1 homopolymerization	1549	0.37	15.6	0.8	
1 copolymerization	3391	0.36			0.953
2 homopolymerization	1630	0.37	15.5	0.8	
2 copolymerization	3450	0.36			0.955
Comparative 5 homopolymerization	1119	0.30	10.2	1.8	
Comparative 5 copolymerization	2025	0.33			0.966
Comparative 6 homopolymerization	1225	0.31	11.5	1.6	
Comparative 6 copolymerization	2581	0.30			0.961
Comparative 7 homopolymerization	1188	0.31	12.6	1.8	
Comparative 7 copolymerization	2431	0.30			0.963

These examples illustrate that the catalysts of the present claims are significantly more effective than the Kaus catalyst. The catalysts of the invention are more active and yield

polymer with a greater bulk density than does the Kaus catalyst. In the above examples, the Kaus catalyst yields homopolymer product having 100 % greater hexane soluble portion (by wt %) than the catalyst of the present invention. The hexane extractable portion impairs both reactor efficiency and polymer properties such as transparency and impact resistance. A lower hexane soluble portion is therefore desirable. *See*, p. 5 of the instant specification. The catalyst of the present invention results in better co-monomer incorporation than does the Kaus catalyst, as evidenced by the lower density copolymer obtained with the present catalyst at the same co-monomer feed. Furthermore, the catalyst of the present invention results in better hydrogen response than does the Kaus catalyst, as evidenced by the higher melt index of polymer obtained with the present catalyst at the same hydrogen feed.

In summary, Applicants respectfully request that the rejection of the present claims under 35 U.S.C. 102 over the Kaus reference be withdrawn because the Kaus reference does not teach every element of the present claims. Specifically, Kaus does not teach or suggest preparing a catalyst component by co-pulverizing a magnesium compound, a compound represented by the general formula  $\text{Al(OR')}_3$ , an electron donor, and a titanium compound. Also, the presently claimed invention manifests results that unexpectedly surpass those obtained with the Kaus catalyst.

b) The Matsuno reference

The Examiner rejected claim 1 under 35 U.S.C. § 102(b) as allegedly being anticipated by JP 54-122387, by Matsuno, et al. Like the Kaus reference, Matsuno fails to teach a catalyst component prepared using a compound represented by the general formula  $\text{Al(OR')}_3$ . Instead, Matsuno uses the inorganic Lewis acid  $\text{AlCl}_3$ . Furthermore, Matsuno does not use a magnesium

compound represented by the general formula  $\text{Mg}(\text{OR})_{2-n}\text{X}_n$  wherein R is an alkyl radical containing up to 12 carbon atoms,  $1 \leq n \leq 2$  and X is a halogen atom, but instead uses magnesium oxide. Applicants respectfully request that this rejection be withdrawn because Matsuno fails to teach every element of the rejected claim.

4. Claim Rejections under 35 U.S.C. § 103

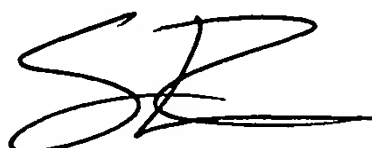
The Examiner rejected claims 11 and 12 under 35 U.S.C. § 103(a) as being unpatentable over Kaus in view of U.S. Patent No. 4,673,661, by Lofgren et al. Specifically, the Examiner alleged that the only difference between the rejected claims and Kaus is that Kaus fails to teach using a silane as an electron donor. The Examiner alleged that Lofgren teaches silane compounds as electron donors, so it would be obvious to combine Kaus and Lofgren to arrive at the rejected claims.

Applicants respectfully traverse because Lofgren fails to teach the deficiencies in the Kaus reference discussed above. Applicants respectfully request that the rejection under 35 U.S.C. § 103(a) be withdrawn because the combined references fail to teach or suggest all elements of the rejected claims. Specifically, the combined references do not teach or suggest a catalyst component prepared by co-pulverizing a magnesium compound, a compound represented by the general formula  $\text{Al}(\text{OR}')_3$ , an electron donor, and a titanium compound.

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The Examiner is invited to contact the undersigned patent agent at 713-787-1558 with any questions, comments or suggestions relating to the referenced patent application.

Respectfully submitted,



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